

# PATENT ABSTRACTS OF JAPAN

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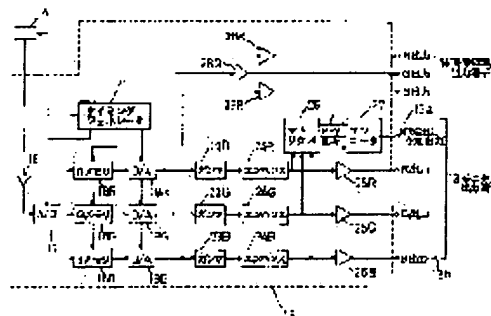
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## (54) ELECTRONIC ENDOSCOPE SYSTEM

### (57)Abstract:

**PURPOSE:** To provide a terminal for image output successively to a terminal for monitor output through simple circuit constitution.

**CONSTITUTION:** The video signal outputted from the solid state image pickup element 4 of an endoscope insertion part is digitized by signals of red, green, and blue and stored in memories 18R..., and reconverted by digital analog converters 19R... into analog signals; and the analog video signals by the colors which are outputted from the digital-analog converters 19R... are sent to the output terminal 13 for monitoring through gamma correcting circuits 23R... and enhancing circuits 24R..., and the output terminal 14 for image processing is provided by branching off from the output terminals of the analog-digital converters 19R.



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CLAIMS

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[Claim(s)]

[Claim 1] The analog-to-digital converter for changing into a digital signal the video signal outputted from the solid state image sensor formed in the endoscope, The memory for dividing and storing the digital video signal outputted from the above-mentioned analog-to-digital converter according to red, green, and the signal of three blue colors, The digital-analog converter for changing respectively into an analog signal the digital video signal according to color outputted from the above-mentioned memory, The gamma correction circuit and enhancing circuit for carrying out gamma correction processing and profile emphasis processing to the analog video signal according to each color outputted from the above-mentioned digital-analog converter, The output terminal for monitors prepared in the output section in order to display an image on a monitor, after passing through the above-mentioned gamma correction circuit and an enhancing circuit, Electronic endoscope equipment characterized by preparing the output terminal for image processings prepared by branching from the outgoing end of the above-mentioned digital-analog converter in order to perform an image processing.

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DETAILED DESCRIPTION

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[Detailed Description of the Invention]

[0001]

[Industrial Application] This invention relates to the electronic endoscope equipment which displayed the observation image on the monitor with the video signal sent from the solid state image sensor formed in the endoscope.

[0002]

[Description of the Prior Art] In electronic endoscope equipment, although an observation image is displayed on a monitor, in order to use it as a legible image [ be / no sense of incongruity ], to the video signal sent to a monitor, gamma correction processing and profile emphasis processing are performed.

[0003] The gamma correction circuit and enhancing circuit for performing such gamma correction processing and profile emphasis processing are conventionally established in the signal line of the analog sent from a solid state image sensor.

[0004] And it is changed into a digital signal with an analog-to-digital converter, and the video signal with which gamma correction processing and profile emphasis processing ended divides according to red (R), green (G), and the signal of three blue (B) colors, is stored in memory, returns again the signal outputted from the memory to an analog signal by the digital-analog converter, and is outputting to the monitor.

[0005]

[Problem(s) to be Solved by the Invention] By performing various kinds of image processings to the video signal of electronic endoscope equipment, diagnostic ability may improve by leaps and bounds.

[0006] However, since it is more desirable for the video signal which becomes the radical to be a raw signal in order to perform an image processing, it is necessary to branch the output terminal for image processings from the signal line before a video signal inputs into a gamma correction circuit and an enhancing circuit.

[0007] Therefore, in the above conventional electronic endoscope equipments, branching must be carried out from video-signal Rhine from a solid state image sensor. Consequently, since the digital-analog converter for returning again the signal outputted from the memory and each memory for storing the signal according to an analog-to-digital converter and 3 colors also on branching Rhine to an analog signal etc. had to be put side by side apart from the object for monitor outputs, circuitry was complicated and there was a fault which becomes cost quantity.

[0008] Then, this invention aims at offering the electronic endoscope equipment which can put the terminal for an image output side by side for the terminal for monitor outputs by easy circuitry.

[0009]

[Means for Solving the Problem] In order to attain the above-mentioned purpose, the electronic endoscope equipment of this invention The analog-to-digital converter for changing into a digital signal the video signal outputted from the solid state image sensor formed in the endoscope, The memory for dividing and storing the digital video signal outputted from the above-mentioned analog-to-digital converter according to red, green, and the signal of three blue colors, The digital-analog converter for

changing respectively into an analog signal the digital video signal according to color outputted from the above-mentioned memory, The gamma correction circuit and enhancing circuit for carrying out gamma correction processing and profile emphasis processing to the analog video signal according to each color outputted from the above-mentioned digital-analog converter, It is characterized by preparing the output terminal for monitors prepared in the output section in order to display an image on a monitor, after passing through the above-mentioned gamma correction circuit and an enhancing circuit, and the output terminal for image processings prepared by branching from the outgoing end of the above-mentioned digital-analog converter in order to perform an image processing.

[0010]

[Example] An example is explained with reference to a drawing. Drawing 2 shows the overall configuration of the electronic endoscope equipment of the example of this invention, and the solid state image sensor 4 which consists of a charge-coupled device (CCD) is built in the image formation location of the photographic subject by the object optical system 3 established at the tip of the insertion section 2 of an endoscope 1. A light guide fiber bundle for 5 to transmit the illumination light which illuminates the observation range, and 6 are connector areas connected to the video processor 10.

[0011] The video processor 10 is making the light equipment for lighting serve a double purpose, and incidence of the illumination light injected from the light source lamp 11 is carried out to the light guide fiber bundle 5 of an endoscope 1.

[0012] the incident light way -- on the way -- being alike -- red (R) -- green -- it arranges so that the 3 color turnable filter 12 with which the color filter of (G) and three blue (B) colors was attached may carry out constant-speed rotation -- having -- \*\*\*\* -- the light guide fiber bundle 5 -- receiving -- red -- green and each blue color illumination light shift time amount, and incidence is carried out to order.

[0013] In the video processor 10, the video-signal processing circuit 15 for processing the video signal outputted and sent from the solid state image sensor 4 is formed. Moreover, the image processing system 60 for performing various kinds of image processings to the monitor TV 50 and video signal for indicating the observation image of an endoscope by playback is formed in the exterior of the video processor 10.

[0014] And the monitor TV 50 and the image processing system 60 are connected to the output terminal 13 for monitors and the output terminal 14 for image processings which connected with the outgoing end of the video-signal processing circuit 15, and were prepared in the video processor 10.

[0015] Drawing 1 shows the video-signal processing circuit 15. After the image pick-up signal of the analog outputted from the solid state image sensor 4 is amplified with an amplifier 16, it is changed into a digital signal in an analog-to-digital converter 17.

[0016] With the timing generator 21, a solid state image sensor 4 and an analog-to-digital converter 17 synchronize, and are driven. And three memory 18R, 18G, and 18B connected to the outgoing end of an analog-to-digital converter 17 at juxtaposition is also driven with the same timing generator 21, a red (R) video signal is most stored in R memory 18R of an eye, a green (G) video signal is stored in the second G memory 18G, and a blue (B) video signal is stored in third B memory 18B.

[0017] And it is read by the digital-analog converters 19R, 19G, and 19B synchronized and driven with a timing generator 21, and the video signal according to color stored in each memory 18R, 18G, and 18B turns into each video signal according to color of an analog, and is outputted.

[0018] And when gamma correction processing is performed by passing through the gamma correction circuits 23R, 23G, and 23B and each color video signal passes through the enhancing circuits 24R, 24G, and 24B continuously, profile emphasis processing is performed.

[0019] Buffers 25R, 25G, and 25B are connected to the outgoing end of the enhancing circuits 24R, 24G, and 24B, and the output terminal 13 (13b) for monitors according to video signal of RGB 3 color is connected to the outgoing end of these buffers 25R, 25G, and 25B.

[0020] moreover, the matrix circuit 26 by which multipoint connection was carried out to the outgoing end of the enhancing circuits 24R, 24G, and 24B -- setting -- a RGB video signal to the luminance signal Y, and a color-difference signal (R-Y) -- and (B-Y) it is made, and it is inputted into an encoder 27 and changed into the composite video signal of NTSC system or a PAL system. And the object for an NTSC

output or the output terminal 13 (13a) for monitors for a PAL output is connected to the outgoing end of the encoder 27.

[0021] To the signal line which branched on the other hand from the outgoing end of the digital-analog converters 19R, 19G, and 19B before each color video signal is inputted into the gamma correction circuits 23R, 23G, and 23B. The buffers 28R, 28G, and 28B for storing temporarily each raw color video signal with which profile emphasis is not considered as a gamma correction are connected, and the output terminal 14 for image processings according to video signal of RGB 3 color is connected to the outgoing end of these buffers 28R, 28G, and 28B.

[0022] Therefore, to the monitor TV 50 connected to the output terminal 13 for monitors, the video signal with which a gamma correction and profile emphasis were always performed is outputted, and the raw video signal with which a gamma correction and profile emphasis always are not given is outputted to the image processing system 60 connected to the output terminal 14 for image processings.

[0023] Therefore, in parallel to it, the good observation image which suited human being's vision is observable with a monitor, performing the exact image processing of the request based on a raw video signal.

[0024]

[Effect of the Invention] Since according to this invention the video signal with which a gamma correction and profile emphasis were always performed is outputted to the output terminal for monitors and the raw video signal with which a gamma correction and profile emphasis always are not given is outputted to the output terminal for image processings. Are concurrent with it, performing the exact image processing based on a raw video signal. Since it is necessary to hardly extend an expensive device in order to be able to observe with a monitor the good observation image which suited human being's vision and to put side by side the output terminal for image processings moreover, it is very realizable by low cost.

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DESCRIPTION OF DRAWINGS

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[Brief Description of the Drawings]

[Drawing 1] It is the circuit block diagram of an example.

[Drawing 2] It is the sketch of the whole configuration of an example.

[Description of Notations]

4 Solid State Image Sensor

13 Output Terminal for Monitors

14 Output Terminal for Image Processings

17 Analog-to-digital Converter

18R, 18G, 18B Memory

19R, 19G, 19B Digital-analog converter

23R, 23G, 23B Gamma correction circuit

24R, 24G, 24B Enhancing circuit

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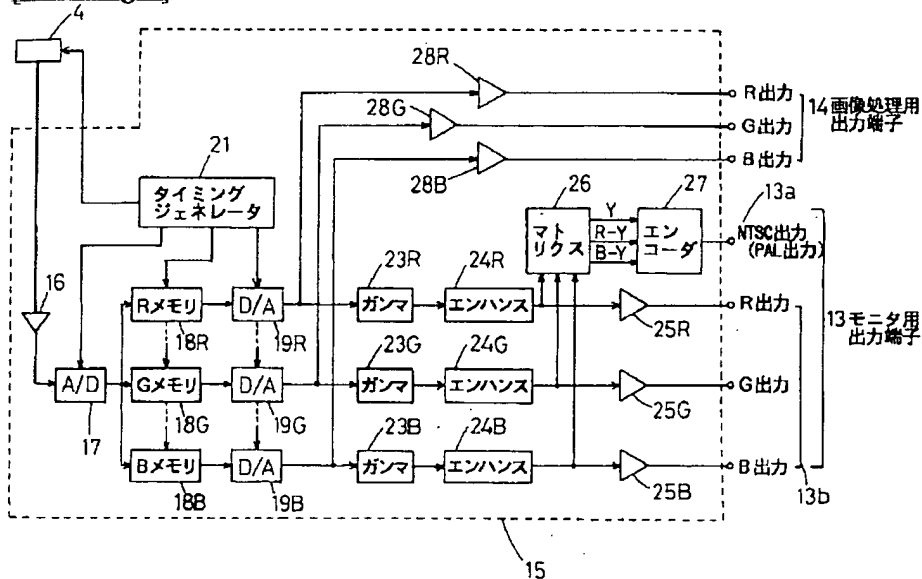
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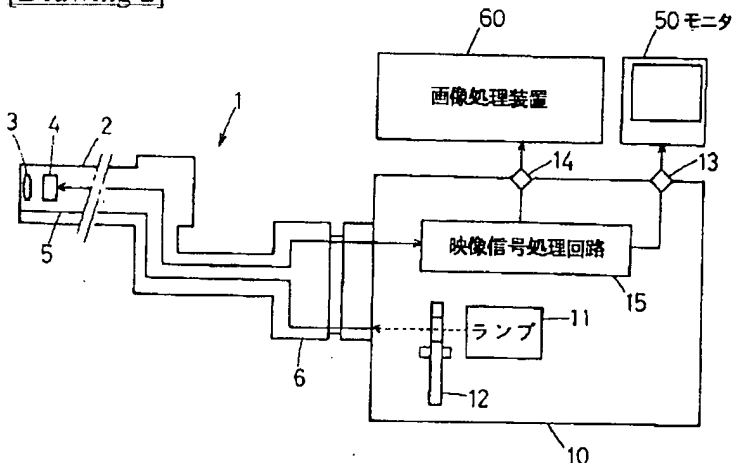
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## DRAWINGS

[Drawing 1]



[Drawing 2]



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